Remarks

Claims 1-38 remain in the application. Claims 1, 3 and 20 have been amended to recite "1.95 to 2.5 wt.% Mg" (basis: specification ¶0028, 0029, 0030 and 0051). In the Office Action, restriction of the claims was required as follows:

> 1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
> I. Claims 1-38, drawn to process of casting, heat treating, and extruding an aluminum alloy, classified in class 148, subclass 552.
> II. Claims 39-64, drawn to an aluminum alloy composition, classified in class 148, subclass 417.
>
> The inventions are distinct, each from the other because of the following reasons:
>
> 2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (IVIIPEP § 806.05(f)). In the instant case the product can be made by a materially different process such as rolling or forging.
>
> 3. Because these inventions are distinct for the reasons given above and the search required for Group II is not required for Group I, restriction for examination purposes as indicated is proper.

Applicants hereby affirm election of claims 1-38 for prosecution.

In the Office Action, the claims were rejected under 35 U.S.C. §103(a), as follows:

> 7. Claims 1-3, 5-19, 30, and 32-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chakrabarti et al (US 2002/01213 19 Al) in view of "Aluminum and Aluminum Alloys" pp. 267, 529.
> Chakrabarti et al teaches a process for manufacturing Al-Zn-Cu-Mg alloy products of high strength (see Table 3) by direct chill casting an ingot (see [0033]), homogenizing in optionally two steps (see [0102]), such as

first heating above 850°F, and then heating to above about 890°F, for a total time of 4-20 hrs or more, which is a close approximation of the presently claimed homogenization treatment), extruding at 600-750°F with an extrusion ratio of 10:1 or more (see [0104]), solution heat treating at 840-900° F in order to take into solution substantially all soluble Zn, Mg, and Cu (see [0105]), quenching, and artificially aging in multiple stages to obtain high strength (see [0017-0019]). Chakrabarti et al teaches performing said process on alloys comprising: 6-10% Zn, 1.2-1.9% Mg, 1.2-2.2% Cu, one or more of: up to 0.4% Zr, up to 0.4% Sc, and up to 0.3% Hf (see [0023]) and optionally 0.0 1-0.06% Ti (see [0026]), which overlaps or touches the boundary of the instant compositional ranges (independent claims I and 30, dependent claims 2, 3, 5, 6, 7, 32, 33). It would have been obvious to one of ordinary skill in the art to select any portion of range, including the claimed range, from the broader range disclosed in Chakrabarti because Chakrabarti finds that the prior art composition in the entire disclosed range has a suitable utility.

Chakrabarti does not teach a) the casting speed of said DC casting, b) extruding in order to obtain a microstructure ≥80% unrecrystallized, or c) homogenizing in order to obtain a uniform distribution of r precipitate and Zr dispersoids.

The rejection is respectfully traversed. Chakrabarti teaches an aluminum alloy containing 6-10% Zn, 1.2 to 1.9% Mg, 1.2 to 2.2% Cu, one or more of up to 0.4% Zr, up to 0.4% Sc, up to 0.3% Hf and optionally 0.01 to 0.06% Ti. Applicants' claimed aluminum alloy, as amended, contains 1.95 to 2.5 wt.% Cu, 1.95 to 2.5 wt.% Mg, 8.2 to 10 wt.% Zn, 0.05 to 0.25 wt.% Zr, max. 0.15 wt.% Si, max. 0.15 wt.% Fe, max. 0.1 wt.% Mn.

It is respectfully submitted that Applicants' invention as claimed is patentable over the teaching of Chakrabarti for a first reason. That is, Applicants' claimed alloy does not overlap or touch the boundary of the invention set forth in Chakrabarti. That is, Applicants' range for Mg of 1.95 to 2.5 is outside the range of 1.2 to 1.9 taught by

Chakrabarti. Thus, for this first reason, Applicants' invention is patentable over Chakrabarti because different alloys are involved.

It is respectfully submitted that Applicants' invention is patentable over Chakrabarti for another reason. That is, Chakrabarti teaches away from Applicants' invention by teaching that higher levels of Mg and Cu result in degradation of strength and fracture toughness at ¶0064, as follows:

> And while the thick gauge, strength-toughness properties for higher Mg and Cu alloy products were similar to or marginally better than those for the 7150 and 7055 controls (dotted trend line), such results clearly demonstrate a significant ***degradation*** in both strength and toughness properties that occurs with a ***moderate increase*** in Cu and Mg: (1) above the Cu and Mg levels of the present invention alloy, and (2) approaching the Cu/Mg levels of many current commercial alloys. (Emphasis added.)

Clearly, Applicants' invention is patentable over Chakrabarti.

It is submitted that Chakrabarti teaches away from Applicants' invention in yet another way. That is, Chakrabarti teaches that low levels of Mg and Cu are required for high strength and fracture toughness, and note in ¶0062, as follows:

> All of those sample numbers-displayed very high fracture toughness combined with high strength properties. Surprisingly, all of those sample alloy compositions belonged to the ***low Cu*** and ***low Mg*** ends of our choice compositional ranges, namely, ***at around 1.5 wt.% Mg together with 1.5 wt.% Cu***, while the Zn levels therefor varied from about 6.0 to 9.5 wt.%. (Emphasis added.)

It will be seen that 1.5 wt.% Mg and 1.5 wt.% Cu are clearly outside the range of the alloy of Applicants' invention. Thus, for this third reason, Applicants' invention is patentable over Chakrabarti.

Applicants' invention is patentable over Chakrabarti for yet a fourth reason. Chakrabarti is concerned with an alloy having reduced quench sensitivity, particularly in thicker gauges, and notes at ¶0053, as follows:

> The present invention is primarily focused on increasing the strength-toughness properties in a 7XXX series aluminum alloy in thicker gauges, i.e. greater than about 1.5 inches. The low quench sensitivity of the invention alloy is of extreme importance. In thicker gauges, the less quench sensitivity the better with respect to that material's ability to retain alloying elements in solid solution (thus avoiding the formation of adverse precipitates, coarse and others, upon slow cooling from SHT temperatures) particularly in the more slowly cooling mid- and quarter-plane regions of said thick workpiece. This invention achieves its desired goal of lowering quench sensitivity by providing a carefully controlled alloy composition which permits quenching thicker gauges while still achieving superior combinations of strength-toughness and corrosion resistance performance.

In Chakrabarti, quench sensitivity is achieved by ***diluting*** the alloying elements. Thus, there is a smaller amount of elements to precipitate. By comparison, Applicants' invention is not concerned with quench sensitivity, and Applicants' invention desires a fast quenching rate to retain the alloying elements in solid solution.

It is respectfully submitted that Chakrabarti teaches away from Applicants' invention in yet another way. Chakrabarti teaches at ¶0031 and 0032, narrow or preferred compositions, which are as follows:

> A narrowly stated composition according to this invention would contain about 6.4 or 6.9 to 8.5 or 9 wt.% Zn, about 1.2 or 1.3 to 1.65 or 1.68 wt.% Mg, about 1.2 or 1.3 to 1.8 or 1.85 wt.% Cu and about 0.05 to 0.15 wt.% Zr. Optionally, the latter composition may include up to 0.03, 0.04 or 0.06 wt.% Ti, up to about 0.4 wt.% Sc, and up to about 0.008 wt.% Ca.
>
> Still more narrowly defined, the presently preferred compositional ranges of this invention contain from about 6.9 or 7 to about 8.5 wt.% Zn, from about 1.3 or 1.4 to about 1.6 or 1.7 wt.% Mg, from about 1.4 to about 1.9 wt.% Cu and from about 0.08 to 0.15 or 0.16 wt.% Zr. The % Mg does

> not exceed (% Cu+0.3), preferably not exceeding (% Cu+0.2), or better yet (% Cu+0.1). For the foregoing preferred embodiments, Fe and Si contents are kept rather low, at or below about 0.04 or 0.05 wt.% each. A preferred composition contains: about 7 to 8 wt.% Zn, about 1.3 to 1.68 wt.% Mg and about 1.4 to 1.8 wt.% Cu, with even more preferably wt.% Mg≦wt.% Cu, or better yet Mg<Cu. It is also preferred that the magnesium and copper ranges of this invention, when combined, not exceed about 3.5 wt.% total, with wt.% Mg+wt.% Cu≦about 3.3 on a more preferred basis.

It will be seen that the ranges for Cu and Mg are much lower and fall outside Applicants' ranges. And in a preferred composition of Chakrabarti, all three elements, Cu, Mg and Zn, fall outside Applicants' ranges. Thus, for this additional reason, Applicants' invention is patentable over Chakrabarti.

It is respectfully submitted that Applicants' invention is patentable over Chakrabarti for yet another reason. Applicants claim casting the alloy at a speed of 1 to 6 inches per minute. Chakrabarti is ***silent*** with respect to such casting speed.

Applicants' invention is different in yet another way. Applicants' invention requires homogenizing in a first temperature range of 840° to 860°F followed by heating in a second temperature range of 860° to 880°F. By distinction, Chakrabarti heats to 890° or 900°F or more (see ¶0102). It is believed that Chakrabarti heats to the higher temperatures because of the dilute alloy being used. Thus, Applicants' invention is patentable over Chakrabarti for this additional reason.

Applicants homogenize at these temperatures to obtain a uniform distribution of η precipitate and zirconium containing dispersoids. Clearly, Chakrabarti is ***silent*** with respect to and do not disclose this feature and accordingly, Applicants' invention is patentable thereover.

It is submitted that Applicants' invention is different from Chakrabarti in yet another way. Applicants' alloy is extruded at a rate such that at least 80% of the extrusion is maintained in the non-recrystallized condition. Chakrabarti is ***silent*** with respect to maintaining at least 80% of the extrusion in the non-recrystallized condition. Thus, for these reasons, Applicants' invention is patentable over Chakrabarti.

Even if Chakrabarti is taken in view of "Aluminum and Aluminum Alloys", pp. 267, 529, the combination does not make Applicants' invention obvious. That is, "Aluminum and Aluminum Alloys" does not supply the parts missing in Chakrabarti. For example, "Aluminum and Aluminum Alloys" is ***silent*** with respect to the alloy in Applicants' claims and only makes general reference to casting rates for aluminum. The casting rate set forth by Applicants is important to obtain a controlled microstructure for further processing (see ¶0031). Thus, for this reason, Applicants' invention is patentable over the combination of Chakrabarti and "Aluminum and Aluminum Alloys".

In the Office Action, it was noted with respect to items (b) and (c), as follows:

> Concerning item a), "Aluminum and Aluminum Alloys" teaches that aluminum ingots can be direct chill cast at casting rates of up to 0.65 ft/mm ($\leq$7.8 inlmin), which substantially overlaps the ranges of 1-6 in/min in instant claim 1, as well at 1-4 in/min in instant claim 30. It would have been obvious to one of ordinary skill in the art to perform the process of casting, heat treating, and working as taught by Chakrabarti, wherein DC casting is performed at speeds $\leq$7.8 in/min, substantially as set forth by "Aluminum and Aluminum Alloys", because "Aluminum and Aluminum Alloys" teaches that said casting rate is conventional for direct chill casting ingots (see p 529).
>
> Concerning items b) and c), the examiner asserts that where the claimed and prior art products are identical or substantially identical in

> structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not." In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Because the prior art teaches a process of homogenizing and extruding said overlapping alloy composition at substantially the same temperatures, then substantially the same results, such as recrystallization and distribution of precipitates and dispersoids, are expected to be present.

It should be noted that the aluminum alloy of Applicants' invention is not "identical or substantially identical" to the inventive alloy of Chakrabarti, and in fact, as shown above, Chakrabarti teaches away from Applicants' alloy. Thus, substantially the same results cannot be expected. Further, as noted earlier, Applicants use a different homogenizing treatment from Chakrabarti. Accordingly, it is respectfully submitted that a prima facie case of anticipation or obviousness has not been made.

In the Office Action, claims 8 and 9 were rejected, as follows:

> Concerning claims 8 and 9, which mention the times for the first and second homogenization steps, the examiner asserts that though Chakrabarti does not teach the particular time schedules as presently claimed, the time at said homogenization temperature is held to be a result effective variable, wherein the recognized result is a more homogenous structure. Changes in temperature, concentrations, or other process conditions of an old process does not impart patentability unless the recited ranges are critical, i.e. they produce a new and unexpected result. However, said parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) See also In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

It is submitted that claims 8 and 9 are patentable over Chakrabarti and "Aluminum and Aluminum Alloys" for the many reasons set forth above. Claim 8 is patentable over this combination for the additional reason that it requires heating in the first temperature range for 6 to 18 hours. It can be seen that Chakrabarti is ***silent*** with respect to heating Applicants' alloy for this period. Similarly, claim 9 is patentable over this combination because it requires heating in a second temperature range for 4 to 36 hours. Chakrabarti is ***silent*** with respect to heating Applicants' alloy for this period in this temperature range.

In the Office Action, claims 11 and 30 were rejected, as follows:

> Concerning claim 11 and independent claim 30, which mentions the extrusion rate, though Chakrabarti does not teach the particular extrusion rate as presently claimed, "Aluminum and Aluminum Alloys" teaches that extrusion rates of 3-6ft/min are typical for 7000 series aluminum alloys (p 267, Fig. 10). It would have been obvious to one of ordinary skill in the art to perform the process of casting, heat treating, and extruding as taught by Chakrabarti, wherein extruding is performed at speeds 3-6ft/min, substantially as set forth by "Aluminum and Aluminum Alloys", because "Aluminum and Aluminum Alloys" teaches that said extrusion speed is conventional for 7000 series alloys (see p 267, Fig. 10).

It is submitted that claims 11 and 30 are patentable over Chakrabarti and "Aluminum and Aluminum Alloys" for the reasons set forth above. Claims 11 and 30 are patentable over this combination for the additional reason that they require extruding Applicants' alloy at a rate in the range of 0.5 to 8 ft./min. to provide an extrusion which is at least 80% non-recrystallized (see claim 1) or substantially all non-recrystallized (see claim 11).

In the Office Action, claims 10, 13-27 and 35-38, were rejected, as follows:

> Concerning claims 10, 13-17, and 35-3 8, as stated above, Chakrabarti et al teaches substantially the same processing steps, including quenching (claim 10), and artificially aging in multiple stages (see [More particularly, Chakrabarti et al teaches aging in 2 or 3 steps- aging at a first temperature of 230-250°F for 2-18 hrs (see [aging at a second temperature of 305-325°F for 6-18 hr (see [and optionally aging at a third temperature of 230-250°F for 2-18 hrs (see [which overlaps the presently claimed aging temperature ranges and times.

It is submitted that claims 10, 13-17 and 35-38 are patentable over Chakrabarti for the reasons set forth above. Claim 10 is patentable over Chakrabarti for the additional reason that it requires rapidly quenching an extrusion fabricated from Applicants' alloy. Claims 13-17 are patentable over Chakrabarti for the additional reasons that they require specific artificial aging practices to provide an extrusion of Applicants' alloy having improved strength and fracture toughness. Likewise, claims 35-38 are patentable over Chakrabarti for the additional reasons that they require artificial aging to provide extrusions of Applicants' alloy having improved strength and fracture toughness.

In the Office Action, claims 12 and 34 were rejected, as follows:

> Concerning claims 12 and 34, Chakrabarti teaches solution heat treating at 840-900°F in order to take into solution substantially all soluble Zn, Mg, and Cu (see [The proper time at the solution heat treatment is held to be a result effective variable, wherein the expected result is a solid solution (see above discussion concerning result effective variables).

Claims 12 and 34 are considered patentable over Chakrabarti for the reasons set forth above. Claim 12 is patentable over Chakrabarti for the additional reason that claim 12 requires solution heat treating Applicants' extrusion at 870° to 890°F for 5 to 120 minutes. Also, claim 34 is patentable over Chakrabarti because it requires solution

heat treating Applicants' alloys in extrusion form at 875° to 885°F for 5 to 120 minutes. Clearly, Chakrabarti are ***silent*** with respect to Applicants' alloy in extrusion form or the solution heat treating required.

In the Office Action, claims 18 and 19 were rejected, as follows:

> Concerning claims 18 and 19, though Chakrabarti does not teach the fracture toughness or tensile strength in relation to a similarly fabricated 7075 alloy, Chakrabarti does teach said alloy processed as stated above exhibits very good strength and toughness (see [abstract). The examiner asserts that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not." In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Because Chakrabarti teaches a substantially overlapping alloy processed substantially as presently claimed, then substantially the same results, such as fracture toughness and strength, are expected to result.

It is submitted that claims 18 and 19 are patentable over Chakrabarti for the reasons set forth above. Claim 18 is patentable for the additional reasons that it requires fracture toughness to be improved by at least 5% over AA7075 on a similar extrusion. Likewise, claim 19 is patentable over Chakrabarti for the additional reason that it requires a tensile strength 8% greater than 7075 alloy on a similar extrusion. It should be noted that extrusions of Applicants' alloy produce tensile and yield strengths of around 100 KSI (see table, spec. p. 19). By comparison, Chakrabarti shows tensile strengths of only 75 to 80 KSI (see Chakrabarti, Figs. 5 and 6). Thus, it will be seen that the alloy and products are not the same because of the large discrepancy in properties as well as alloy

composition. It should be noted that the alloy does not overlap. Accordingly, claims 18 and 19 are patentable over Chakrabarti.

In the Office Action, claims 4, 20-29 and 31 were rejected, as follows:

> Claims 4, 20-29, 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chakrabarti et al (US 2002/01213 19 Al) and "Aluminum and Aluminum Alloys" pp. 267 and 529, as applied to claims above, in view of Holroyd (US 5,932,037).
>
> Chakrabarti does not teach the instant range of Cr (claims 4, 20, 31). However, Holroyd teaches that both Zr and Cr are known recrystallization inhibitors added to 7000 series alloys, wherein alloys with Cr require less critical control of homogenization and lower extrusion pressures (column 2 lines 32-43), and while alloys with Zr are less quench sensitive and potentially have higher fracture toughness (column 7 lines 56-67). It would have been obvious to one of ordinary skill in the art to replace Zr taught by Chakrabarti with Cr (or to have both as recrystallization inhibitors, see Holroyd at column 2 lines 31, 44), because Holroyd teaches that both elements are known recrystallization inhibitors added to 7000 series alloys, andlor because alloys with Cr require less critical control of homogenization and lower extrusion pressures (column 2 lines 32-43).
>
> Concerning dependent claims 21 and 22, as stated above, Chakrabarti teaches an overlapping alloy composition.
>
> Concerning dependent claim 23, see arguments above concerning solution heat treatment.
>
> Concerning dependent claims 24-27 and 29, as stated above, Chakrabarti teaches an overlapping aging schedule.
>
> Concerning dependent claim 28, see arguments above concerning fracture toughness.

Claims 4, 20-29 and 31 are patentable over Chakrabarti, "Aluminum and Aluminum Alloys" and Holroyd '037 for the reasons given above. In Chakrabarti, there is a teaching away from the use of Cr. That is, Chakrabarti note at ¶0027, that "Cr is preferably avoided . . .". "Aluminum and Aluminum Alloys" is ***silent*** with respect to the use of Cr. Holroyd discloses a completely different alloy from Applicants' alloy wherein the levels of Zn used are much lower than in Applicants' alloy. Thus, it is submitted that

claims 4, 20-29 and 31 are patentable over this combination of Chakrabarti, "Aluminum and Aluminum Alloys" and Holroyd.

With respect to claims 21 and 22, it is submitted that these claims are patentable over Chakrabarti for the reasons given above. It should be noted that the claims, as amended, do not overlap the Chakrabarti reference. Also, claims 23 and 29 are patentable over the cited references for the reasons given above.

In view of the above amendments and remarks, it will be noted that a sincere attempt has been made to place this application in condition for allowance. Therefore, reexamination and reconsideration are requested and allowance solicited at an early date.

Respectfully submitted,

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